AbstractID: 1723 Title: A Segmented 32P Source Monte Carlo Model to Derive AAPM TG-60 Dosimetric Parameters Used for Intravascular Brachytherapy

A new high dose rate 20 mm ^{32}P intravascular brachytherapy (IVB) beta source used with automated stepping has recently been introduced. The AAPM Task Group 60 recommends that beta IVB sources should have well characterized dosimetric parameters in water. In this study, Monte Carlo simulations (MCNPX v 2.4) were used to derive these parameters for a 2 mm source segment rather than the entire 20 mm source to insure correct formulation using the traditional TG-60 and TG-43 polar coordinate system (r, θ) parameters. The dose rate at the reference depth of 2 mm, the radial dose function, and the anisotropy function were generated for the 2 mm ^{32}P source segment at mid-plane, distal edge and proximal edge of the original 20 mm source. Our results indicate that the anisotropy of the 2 mm distal and proximal segments are the same, but differ from that of the mid-plane segment due to the perturbation of the adjacent tungsten marker. Using the TG-60 formulation of the mid-plane and edge segments resulted in dose distributions similar to those obtained for a 20 mm linear beta source model. The segmented formulation provides a method consistent with the familiar TG-60 formulation and ability to calculate the dose-distribution inside curved vessels.

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